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EXPERIMENT DATA ANALYSIS REPORT

OGO-A EXPERIMENT NO. 1

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NASA Contract
NAS5-2222

Principal Investigator: Professor Kinsey A. Anderson

The University of California scintillation counter on the OGO-A satellite consists of a CsI crystal surrounded by a plastic anti-coincidence shield as shown in Figure 1. Pulses from the photomultiplier tube that views the crystal are sorted into 32 channels of pulse height analysis. The experiment was designed to detect 3 to 90 MeV protons. Protons of E > 90 MeV will not stop in the crystal but will also traverse the shield and not be counted. Hence any particle leaving more than 90 MeV in the crystal and not traversing the shield will be a particle of Z > 1. An Americium alpha source with a 4.4 MeV effective energy loss in the crystal is used for calibration purposes.

After experiment turnon the quiet-time background spectrum could not be accounted for by the 3 — 90 MeV cosmic ray flux which had been measured previously on other detectors. A typical quiet time spectrum is shown in Figure 2. The narrow peak in Channel 15 can not be explained by any natural phenomenon and is presumed to be instrumental in origin. The second peak in Channel 3 is presumed to be due to the energy left in the crystal by minimum-ionizing cosmic rays which have not been gated out by the anticoincidence circuitry. The reason or reasons for the failure of the anticoincidence is not known. It is clear that the failure occurred sometime before experiment turnon.

Since the experiment was designed to study solar cosmic rays, the most interesting times of observation are those times during which a proton flare occurs. At the time of launch (September, 1964) the sun was very near the minimum of the solar cycle of activity. The first proton event which occurred was on February 5, 1965, during the low

power season when the experiment was turned off. The first event which we observed occurred on October 4, 1965. Other proton events are listed in Table 1.

The main problems in dealing with the OGO-A data are that the anti-coincidence does not function and that much of the time coverage of an event is very fragmentary. A lack of anticoincidence makes it very difficult to derive either the fluxes or the spectrum of the observed protons. In general, the time behavior of the event can still be studied profitably. The only paper published (Kahler, et al. 1967) thus far containing OGO-A data dealt with an interpretation of the time behavior of the detector counting rates for a proton event. In addition the time coverage incuded the onset, peak, and decay of the event without any breaks.

It is anticipated that future studies using the OGO-A data from the events of Table 1 will involve supplementing the data obtained by the OGO-B experiment and an estimation of the behavior of alpha particles (derived from the highest channels where $E > 90$ MeV) compared with that of protons for the same energy/neutron range.

BIBLIOGRAPHY

Kahler, S. W., J. H. Primbsch, and K. A. Anderson. Energetic Protons from the Solar Flare of March 24, 1966. *Solar Physics 2*: 179-191, 1967.

TABLE 1

Dates on which solar proton events were observed on OGO-A

(through summer, 1967)

Date	Note
October 4, 1965	Particles from southern hemisphere flare
March 24, 1966	Results discussed in *Solar Physics*
May 2, 1966	Considerable problem with errors
September 20, 1960	No data during onset or peak of event
September 27, 1960	No data during onset or peak of event
March 11, 1967	Excellent coverage of onset, peak, and decay
May 7, 1967	Fragmentary time coverage
May 23, 1967	Fragmented, no data for onset
May 28, 1967	Severe problem with errors in data

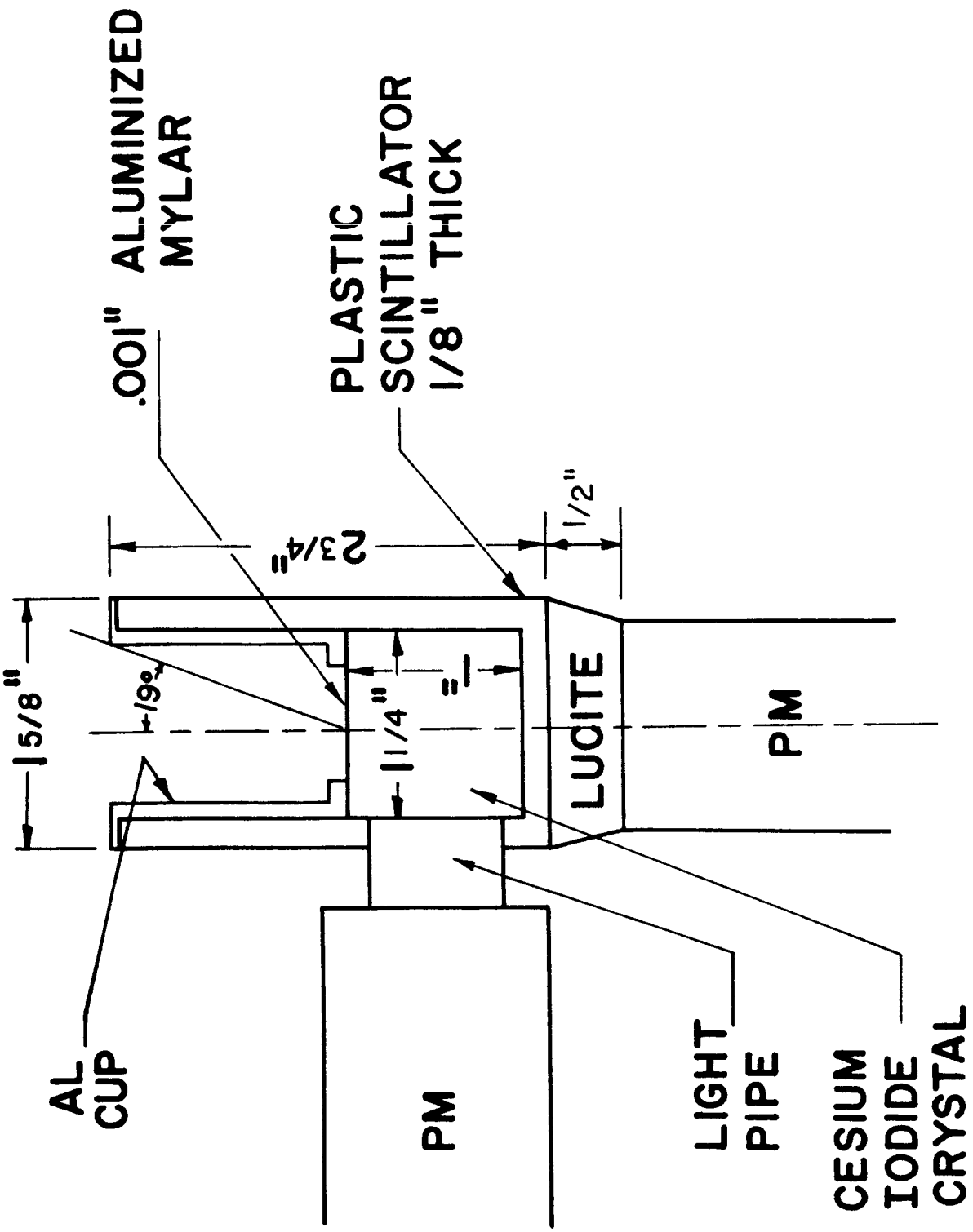

Figure 1. Cross sectional view of the University of California scintillation counter on OGO-A.

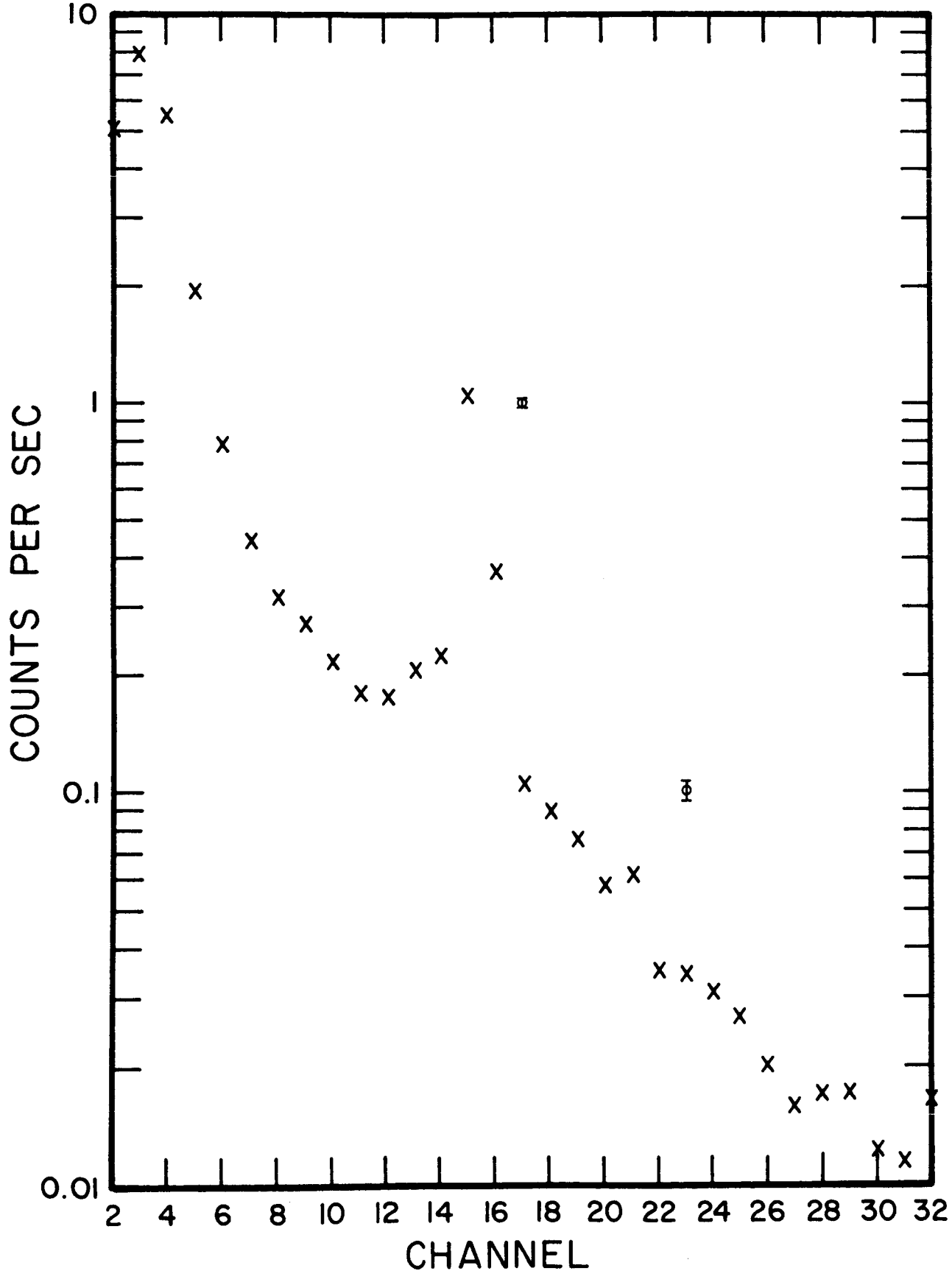

Figure 2. Typical background counting rates of the OGO-A detector. Because of malfunction, Channel 1 is not used.